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(57) **Abstract**

**Objects of the Invention** This invention aims at excelling in rigidity and a mechanical property and the gloss of mold goods and a surface appearance offering a good fiber consolidation aromatic series polycarbonate resin constituent.

**Elements of the Invention** Aromatic series polycarbonate resin, the fiber consolidation polycarbonate resin constituent which blended a hydroxyl content polymer and poly lactone with the constituent which consists of a fibrous bulking agent.

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**Claim(s)**

**Claim 1** (A) The aromatic series polycarbonate resin constituent which comes to blend (C) hydroxyl content polymer 0.05 - 30 weight sections, and (D) poly lactone 0.05 - 30 weight sections to the resin constituent 100 weight section which consists of 0.1 - 50 % of the weight of bulking agents which contain 50 - 99.9 % of the weight of aromatic series polycarbonate resin, and the fibrous bulking agent of (B) ratio-of-length-to-diameter  $\geq 3$  20% of the weight or more.

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**Detailed Description of the Invention**

**0001**

**Industrial Application** This invention relates to a fiber consolidation aromatic series polycarbonate resin constituent. Furthermore, the surface appearance at the time of excelling in

rigidity, a mechanical property, etc. in detail, and considering as mold goods is related with a good fiber consolidation aromatic series polycarbonate resin constituent.

#### 0002

**Description of the Prior Art** The aromatic series polycarbonate resin strengthened with fibrous bulking agents, such as a glass fiber and carbon fiber, maintains the property which was excellent in aromatic series polycarbonate resin, and is broadly used in the various industrial fields as engineering plastics which were further excellent in rigidity, thermal resistance, dimensional stability, etc.

**0003** In order to obtain mold goods with a good appearance with these fiber consolidation aromatic series polycarbonate resin, the die temperature needed to be set up very highly, and it had the fault that a molding cycle became long. Then, although the attempt (JP,3-46023,A) which improves the gloss of mold goods and a surface appearance was made without spoiling the rigidity and shock resistance which fiber consolidation aromatic series polycarbonate resin has by blending a glass staple fiber and glass ultrashort fiber at a fixed rate, and carrying out little combination of the poly lactone, it was that of a good backlash potato as fully being improved.

**0004** Furthermore, the constituent with good gloss of mold goods and surface appearance was demanded, without spoiling rigidity, a mechanical property, etc. which fiber consolidation polycarbonate resin has.

#### 0005

**Problem(s) to be Solved by the Invention** This invention aims at excelling in rigidity and a mechanical property and the gloss of mold goods and a surface appearance offering a good fiber consolidation aromatic series polycarbonate resin constituent.

**0006** As a result of repeating examination wholeheartedly that the above-mentioned object should be attained, by blending a hydroxyl content polymer and poly lactone with aromatic series polycarbonate resin and the constituent which consists of a fibrous bulking agent, this invention persons found out that the fiber consolidation polycarbonate resin constituent made into the object was obtained, and reached this invention.

#### 0007

**Means for Solving the Problem** This invention relates to the fiber consolidation aromatic series polycarbonate resin constituent characterized by coming to blend (C) hydroxyl content polymer 0.05 - 30 weight sections, and (D) poly lactone 0.05 - 30 weight sections to the resin constituent 100 weight section which consists of 0.1 - 50 % of the weight of bulking agents which contain 50 - 99.5 % of the weight of (A) aromatic series polycarbonate resin, and the fibrous bulking agent of (B) ratio-of-length-to-diameter  $\geq 3$  20% of the weight or more.

**0008** the viscosity average molecular weight 10,000-100,000 to which (A) aromatic series polycarbonate resin used by this invention is guided from dihydric phenol -- it is aromatic series polycarbonate resin of 15,000-60,000 preferably, and it is made to usually react with the solution method or scorification of dihydric phenol and a carbonate precursor, and is manufactured. As dihydric phenol used here, although aimed at a 2 and 2-bis(4-hydroxyphenyl) propane **common-name bisphenol A**, the part or all may be replaced by other dihydric phenols. As other dihydric phenols, a bis(4-hydroxyphenyl) methane, 1, and 1-bis(4-hydroxyphenyl) ethane, 2, and 2-bis(4-hydroxy - 3, 5-dimethylphenyl) propane, 2, and 2-bis(4-hydroxy-3-methylphenyl) propane, bis(4-hydroxyphenyl) sulfone, etc. are raised, for example. Moreover, as a carbonate precursor, carbonyl halide, carbonate ester, or halo formate is raised, and they are specifically the dihaloformate and such mixture of a phosgene, diphenyl carbonate, and a dihydric phenol. In manufacturing aromatic series polycarbonate resin, the catalyst for promoting a suitable molecular weight modifier, a branching agent, and a reaction etc. can be used. It does not interfere, even if it mixes two or more sorts of the aromatic series polycarbonate resin obtained in this way.

**0009** Although a glass fiber, carbon fiber, silicon carbide fiber, brass fiber, stainless steel fiber, potassium titanate, the fiber that consists of way acid aluminum or a whisker, aromatic polyamide fiber, etc. can be mentioned as an example of the bulking agent which contains the fibrous bulking agent of (B) ratio-of-length-to-diameter  $\geq 3$  used by this invention 20% of the weight or more, a glass fiber and carbon fiber are desirable. Reinforcement effectiveness with the content of the fibrous bulking agent of ratio-of-length-to-diameter  $\geq 3$  sufficient at less than 20 % of the weight is not acquired, and it is not desirable. Furthermore, these fibrous bulking agents of ratio-of-length-to-diameter  $\geq 3$  have especially the desirable carbon fiber that converged with the glass fiber, the epoxy resin, and/or urethane resin which surface treatment is performed by the amino system silane coupling agent and/or the epoxy system silane

coupling agent, and converged with an epoxy resin and/or urethane resin. ratios of length to diameter (fiber length/diameter of fiber) from which these fibrous bulking agents serve as a rule of thumb of the reinforcement effectiveness by fiber are three or more things.

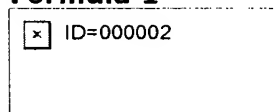
Reinforcement effectiveness sufficient in ratio of length to diameter having used less than three fibrous bulking agent is not acquired. As bulking agents other than the fibrous bulking agent of ratio-of-length-to-diameter  $\geq 3$ , they are the shape of tabular **which is illustrated, for**

**example with a silica, talc, a mica, a glass bead, a glass flake, glass powder, a metal powder, molybdenum disulfide, etc.**, and a flake, and the bulking agent of powdered \*\*.

**0010** (C) hydroxyl content polymers used in this invention are all polymers that contain the hydroxyl which has a proton supply property in the structure. The graft copolymer obtained by carrying out the graft of the functionality hydroxyl to the polymer which used as the base the polymer which already contains hydroxyl in principal chains, such as polyvinyl alcohol, an olefin vinyl alcohol copolymer, and a polyolefine polyvinyl alcohol block copolymer, or a copolymer, other polyolefines, polystyrene, or a rubber elastomer as an example of a suitable polymer can be mentioned. The polymer which consists of the diol and epihalohydrin of aliphatic series or aromatic series among these hydroxyl content polymers desirable still more preferably Phenoxy resin, an epoxy resin, for example, the bisphenol A mold phenoxy resin compounded from bisphenol A and epichlorohydrin, and/or the bisphenol A mold epoxy resin, The bisphenol female mold epoxy resin compounded from Bisphenol F and epichlorohydrin, The epoxy resin which glycidyl-ether-ized the phenol novolak and O-cresol novolak, Glycidyl ester and dimer acid diglycidyl ester which denaturalized dimer acid in the frame of a bromination epoxy resin and the bisphenol A mold epoxy resin, And the flexible epoxy resin by rubber denaturation and the 3rd class aliphatic series denaturation, a hydrogenation bisphenol A mold epoxy resin, etc. can be mentioned.

**0011** For (D) poly lactone used in this invention, the general formula of a repeat unit is **0012**.

#### Formula 1



**0013** (-- here -- R1 and R2 -- hydrogen or the alkyl group of 1-5 carbon numbers -- desirable - - hydrogen or a methyl group -- it is -- X -- 2-10 -- desirable -- 3-8 -- it is -- n -- 50-3000 -- it is 80-2000 preferably.) -- it is expressed. Although the end group of this poly lactone is a hydroxyl group or a carboxylic-acid radical, it may usually use what esterified these end groups and was etherified. Especially as these poly lactone, the poly caprolactone of number average molecular weight about 10000-200000 is suitable.

**0014** The resin constituent in this invention is manufactured by mixing the four above-mentioned kinds of components. A mixed rate 50 - 99.9 % of the weight of (A) aromatic series polycarbonate resin, 0.1 - 50 % of the weight of bulking agents which contain 70 - 99.9 % of the weight, and the fibrous bulking agent of (B) ratio-of-length-to-diameter  $\geq 3$  20% of the weight or more preferably, the resin constituent 100 weight section which consists of 0.1 - 30 % of the weight preferably -- receiving -- (C) hydroxyl content polymer 0.05 - 30 weight sections -- desirable -- 1 - 20 weight section, and (D) poly lactone 0.05 - 30 weight sections -- it comes to carry out 1-20 weight section combination preferably

**0015** (B) If the loadings of the bulking agent which contains the fibrous bulking agent of ratio-of-length-to-diameter  $\geq 3$  20% of the weight or more exceed 50 weight sections, a moldability will fall extremely and reinforcement effectiveness sufficient in under the 0.1 weight sections will not be acquired. (C) If the loadings of a hydroxyl content polymer exceed 30 % of the weight, sufficient mechanical strength will not be obtained but the appearance amelioration effectiveness will serve as imperfection less than by 0.05. Moreover, if the appearance amelioration effectiveness has the inadequate loadings of (D) poly lactone in under the 0.05 weight section and they exceed 30 weight sections, lowering of heat deflection temperature becomes large and is not desirable.

**0016** Preparation of the constituent which consists of the above-mentioned aromatic series polycarbonate resin in this invention, a hydroxyl content polymer, poly lactone, and a bulking agent is carried out with the usual mixer and a kneading machine. That is, after supplying each component to a V type blender, a ribbon mixer, or a tumbler and mixing to homogeneity, melting kneading is carried out with the usual extruders, such as one shaft or two shafts, and it cuts to the pellet type after cooling. At this time, a part of glass fibers and other components

may be added from the middle of an extruder. Moreover, beforehand, after mixing and kneading, the further remaining components may be added and a part of component may be extruded.

**0017** Flame retarders (for example, a bromination bisphenol, bromination polystyrene, a bromination polycarbonate, etc.), fire-resistant assistants (for example, an antimony trioxide, sodium antimonate, etc.), stabilizers (for example, phosphoric ester, phosphite, etc.), antioxidants (for example, hindered phenol system compound etc.), light stabilizer, a coloring agent, a foaming agent, lubricant, a release agent, an antistatic agent, etc. may be blended with the constituent of this invention in the range which does not spoil the object of this invention. Moreover, other little thermoplastics, rubber, etc. may be added.

**0018** The constituent obtained in this way can be easily fabricated by the approach of arbitration, such as injection molding, extrusion molding, compression molding, or rotational casting.

#### **0019**

**Example** An example is raised to below and this invention is further explained to a detail. In addition, assessment was based on the following approach. Surface appearance; viewing estimated the surface appearance. The valuation basis is as follows.

O : the float of a bulking agent is not known but it is an appearance near when you have no bulking agent.

\*\* : The float of a bulking agent understands a few.

x : The float of a bulking agent is known.

Impact strength; according to ASTM D256, Izod impactive strength with a notch was measured with 1/8" test piece.

Load deflection temperature; ASTM D648 is followed and it is 18.6 kgf/cm<sup>2</sup>. Load deflection temperature was measured by the load.

Moldability; injection pressure 800 kgf/cm<sup>2</sup> Floating length was measured by the Archimedes mold spiral flow (3mm of thickness).

**0020** each component shown in examples 1-5 and the **examples 1-4 of comparison table 1** - amount mixing of table 1 publication -- carrying out -- vent type extruder of **30mm of diameters -- it pelletized at 280 degrees C of cylinder temperatures by VSK-30 made from NAKATANI**. After drying this pellet at 120 degrees C for 5 hours, the test piece was created with the cylinder temperature of 280 degrees C, and the die temperature of 70 degrees C with the injection molding machine **J by the Japan Steel Works, Ltd. -120SA**, and the assessment result was shown in a table 1.

**0021** In addition, the notation which shows each component of table 1 publication is as follows.

(A) Aromatic series polycarbonate resin bisphenol A mold polycarbonate : panlight L-1250 Made in Teijin Chemicals, viscosity average molecular weight 25,000 (Following PC is called)

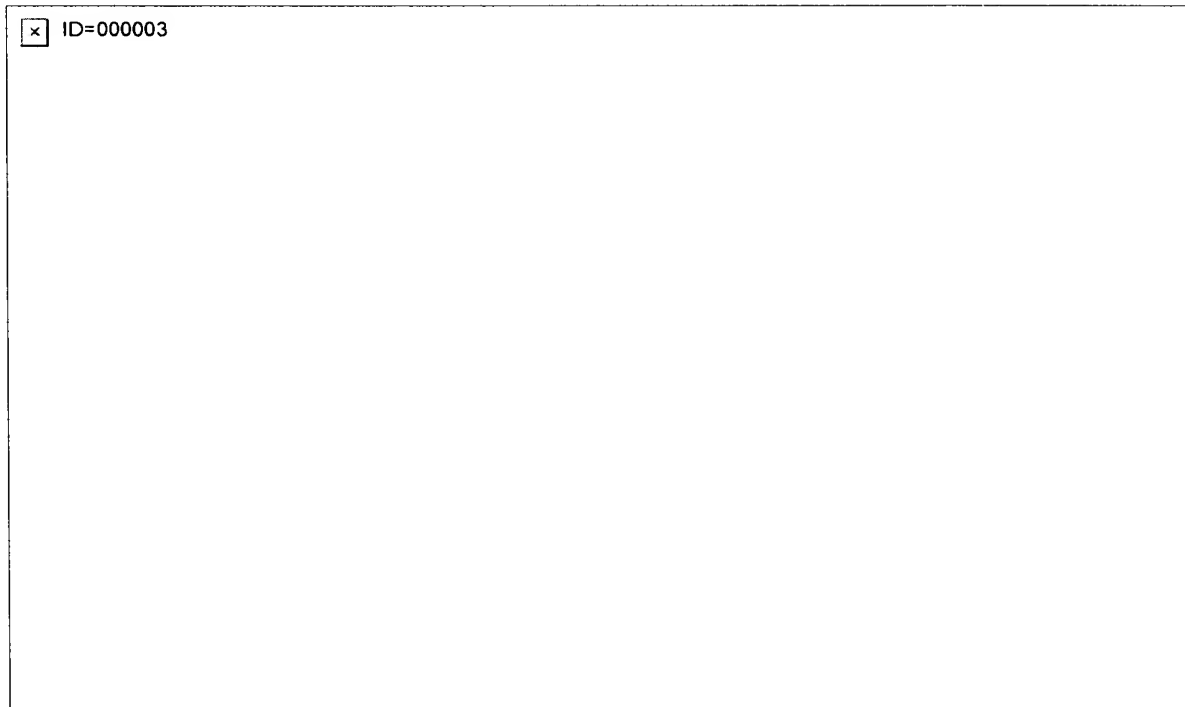
(B) Bulking agent **\*\*CF** : the chopped strand cut to about 10mm was used after focusing by carbon fiber (PAN system), path = 7micrometer, and the epoxy system sizing agent.

**0022** **\*\*CS** : the chopped strand cut to about 7mm was used after focusing by the glass fiber, path = 13micrometer, the epoxy system, and the urethane system sizing agent.

(C) hydroxyl content polymer **\*\* bisphenol A mold phenoxy resin** : -- **\*\* bisphenol A mold epoxy resin by FENOTOTO YP-50 Tohto Kasei Co., Ltd.** : -- EPO TOTO YD -- (D) poly lactone PORI epsilon-caprolactone: -- the product made from plaque cel H-7 Die Cel Industry, and number average molecular weight 90,000 (Following PCL is called) **by -7020 Tohto Kasei Co., Ltd.**

#### **0023**

#### **A table 1**

**0024**

**Effect of the Invention** The constituent of this invention is excellent in rigidity, the mechanical property, the surface appearance, etc., and suitable for the exterior parts of the electrical and electric equipment and a precision mechanical equipment etc. Moreover, mold goods with a good appearance can be obtained in a short molding cycle.

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